1994 · CONTENTS

ANIMAL BEHAVIOUR

EXECUTIVE EDITORS

TIMOTHY J. ROPER
UNIVERSITY OF SUSSEX

MEREDITH J. WEST
INDIANA UNIVERSITY

EDITORS

CHRISTOPHER J. BARNARD
MARIAN STAMP DAWKINS
FRED C. DYER
TIMOTHY R. BIRKHEAD
ROBIN I. M. DUNBAR
ELLEN D. KETTERSON
DALE F. LOTT

MANAGING EDITORS

KRIS M. BRUNER
ANGELA K. TURNER

ACADEMIC PRESS · LONDON

© 1994 The Association for the Study of Animal Behaviour

CONTENTS OF VOLUME 47

Actitis macularia: copulation patterns and mate guarding 1065
ADAMO, S. A. & HOY, R. R. Mating behaviour of the field cricket *Gryllus bimaculatus* and its dependence on social and environmental cues 857
ADDINGTON, R. L., *see* GUBERNICK, D. J.
Adoption in a precocial species, the lesser snow goose 101
Age: effect on glance rate in young baboons 749
Age: role in behavioural development of food-storing and retrieval in marsh tits, *Parus palustris* .. 1435
Age, worker's, regulates the dominance hierarchy in the ant *Pachycondyla sublaevis* 179
Agonistic behaviour in the velvet swimming crab, strategic decisions during 885
Aggression and behavioural plasticity in choruses of the Pacific treefrog 633
Aggression, female, and mate choice in the blue tit 943
ALATALO, R. V., *see* PALOKANGAS, P.
ALBERTS, A. C., *see* PRATT, N. C.
ALBERTS, S. C. Vigilance in young baboons: effects of habitat, age, sex and maternal rank on glance rate 749
ALLAN, S. E. & SIMMONS, A. M. Temporal features mediating call recognition in the green treefrog, *Hyla cinerea*: amplitude modulation 1073
Allodapine bee *Exoneura bicolor*, order of adult eclosion and reproductive dominance 373
Alloparental care and the influence of father presence on juvenile prairie voles, *Microtus ochrogaster* .. 281
Altruism and adoption in the lesser snow goose 101
Amphisbaenian, *Blanus cinereus*, pheromone detection by 1401
Anolis aeneus: territory acquisition 1375, 1387
Anolis carolinensis: male territorial headbob signals 251
Ant, *Pachycondyla sublaevis*, dominance hierarchy in 179
Antilocapra americana females choose vigorous mates 33
Anti-predation strategy, flocking, in redshanks 433
Anti-predator strategies of *Desmognathus ochrophaeus* 1
Apis mellifera ligustica: risk-sensitive foraging 933
Apis mellifera ligustica: search time to find a food-storer bee and nectar collecting and processing .. 311
Apodemus sylvaticus: trail-following behaviour 1127
ATKINSON, R. J. A., *see* SMITH, I. P.
Audience effects and food calling in male chickens 1159
Avifauna, Australian, cooperative breeding in, and brood parasitism by cuckoos 697
Baboons, young, *Papio cynocephalus*, vigilance in; glance rate 749
BANSCHBACH, V. S. & WADDINGTON, K. D. Risk-sensitive foraging in honey bees: no consensus among individuals and no effect of colony honey stores 933
BARRIE, B. D., *see* HUNTINGFORD, F. A.
Bat calls: assessing signal variability and reliability 757
BATESON, M., *see* COOK, S. E.
BAUCHAU, V., *see* GÉRARD, D. 877
Bees, allodapine, *Exoneura bicolor*, order of adult eclosion and reproductive dominance 373
Bees, bumble, *Bombus*; learning and flower morphology 531
Bees, honey, *Apis mellifera ligustica*; risk-sensitive foraging 933
Bees, honey, *Apis mellifera ligustica*, search time to find a food-storer bee, and nectar collecting and processing 311
Bees, stingless, *Trigona fluviventris*, avoidance-learning by; effect of pattern and colour 1087
BEECHER, M. D., CAMPBELL, S. E. & BURT, J. M. Song perception in the song sparrow: birds classify by song type but not by singer 1343
Beetle, burying, *Nicrophorus orbicollis*; behavioural compensation for mate loss 777
Beetle, deathwatch, *Xestobium rufovillosum*, mate location in; orientation to substrate vibrations .. 899
BENHAMOU, S. Spatial memory and searching efficiency 1423
BENNUN, L. The contribution of helpers to feeding nestlings in grey-capped social weavers, *Pseudonigrita arnaudi* 1047
Bill morphology and grooming in birds 195
Bill sweeping hydrodynamics in the spoonbill, *Platalea leucordia* 649
Bimaturism, sexual, in the green iguana 1101
BIRCH, M. C., *see* GOULSON, D.
Birds: bill morphology and grooming behaviour 195
BIRKELAND, K., *see* JAKOBSEN, P. J.
Blanus cinereus, pheromone detection by 1401
Blenny, rock-pool, *Lipophrys pholis*: entrainment of a circa-tidal rhythm in, by simulated wave action 663
Bluebirds, eastern, *Sialia sialis*, competition for nestboxes affects mate guarding 295

Bluegills, *Lepomis macrochirus*, continuously update patch giving-up times based on foraging experience 501
BOCKWINKEL, G. & SAUER, K. P. Resource dependence of male mating tactics in the scorpionfly, *Panorpa vulgaris* (Mecoptera, Panorpidae) 203
BOELLSTORFF, D. E., OWINGS, D. H., PENEDO, M. C. T. & HERSEK, M. J. Reproductive behaviour and multiple paternity of California ground squirrels 1057
BOESCH, C. Chimpanzees–red colobus monkeys: a predator–prey system 1135
BOLDA, K. S., *see* PRATT, N. C.
Bombus fervidus: learning and flower morphology 531
Bombus impatiens: learning and flower morphology 531
Bombus rufocinctus: learning and flower morphology 531
Bombus vagans: learning and flower morphology 531
Bowerbirds, male; why do they destroy each other's bowers? 607
BOYCE, M. S., *see* SPURRIER, M. F.
Bracon hebetor: sex ratio and foundress number 687
BRADBURY, C. G., *see* STOREY, A. E.
BRADBURY, J. W., *see* YOUNG, J. R.
BRAUN, C. E., *see* YOUNG, J. R.
Breeding, cooperative, in the Australian avifauna and brood parasitism by cuckoos 697
BRENOWITZ, E. A. & ROSE, G. J. Behavioural plasticity mediates aggression in choruses of the Pacific treefrog 633
BRODIE, E. D., JR, *see* HILEMAN, K. S.
BRODIN, A. Separation of caches between individual willow tits hoarding under natural conditions.. 1031
Brood parasitism by cuckoos, cooperative breeding in the Australian avifauna and 697
BURT, J. M., *see* BEECHER, M. D.
Bushcrickets, *Requena verticalis*: male mate choice 117
BUTLIN, R. K., *see* CHARALAMBOUS, M.
Butterflies, chequered skipper, *Carterocephalus palaemon*, environmental influences on mate location in males 1179
Butterflies, owl, *Caligo* and *Opsiphanes*, shivering and its cost during reproductive behaviour .. 23
Butterflies, swallowtail, African, *Papilio dardanus*, mate choice in 389
BYERS, J. A., MOODIE, J. D. & HALL, N. Pronghorn females choose vigorous mates 33
Bystanders, cultural, transmission in pigeons is affected by the number of tutors and 331
Caches: separation between individual willow tits hoarding under natural conditions 1031
CADIOU, B., MONNAT, J. Y. & DANCHIN, E. Prospecting in the kittiwake, *Rissa tridactyla*: different behavioural patterns and the role of squatting in recruitment 847
Caligo: shivering and its cost during reproductive behaviour 23
Calls, bat; assessing signal variability and reliability 757
Calls and female treefrogs; mechanisms of mate choice 1323
Calls, food-associated, in cotton-top tamarins 263
Call recognition, temporal cues of, in the green treefrog 1073
CAMPBELL, S. E., *see* BEECHER, M. D.
Cannibalism, filial, in garibaldi damselfish 1149
Cannibalism, sexual, and its relation to male mating success in sagebrush crickets 1171
CARO, T. M., *see* LAURENSON, M. K. 547
Carterocephalus palaemon, male, environmental influences on mate location in 1179
Causal and functional questions: how are they linked? 999
Centrocercus urophasianus, captive, lek behaviour 303
Centrocercus urophasianus: phenotypic divergence of secondary sexual traits 1353
Cercocebus torquatus atys: dominance rank 589
Cercopithecus diana females, role in territorial defence 425
Chaffinches, *Fringilla coelebs*; role of female in sperm competition 163
CHANDLER, C. R., KETTERSON, E. D., NOLAN, V., JR & ZIEGENFUS, C. Effects of testosterone on spatial activity in free-ranging male dark-eyed juncos, *Junco hyemalis* 1445
CHARALAMBOUS, M., BUTLIN, R. K. & HEWITT, G. M. Genetic variation in male song and female song preference in the grasshopper *Chorthippus brunneus* (Orthoptera: Acrididae) 399
Cheetahs, free-living, monitoring the effects of non-trivial handling in 547
Chemical cues in group member discrimination by *Spermophilus columbianus* 803
Chemicals, prey; lizard response 765
Chen caerulescens caerulescens: adoption 101
Chicks, *Gallus gallus domesticus*, young; detour behaviour 123
Chickens, *Gallus gallus*, male, food calling and audience effects in 1159
Chimpanzees, *Pan troglodytes*, and red colobus monkeys: a predator–prey system 1135

CONTENTS

Chipmunks, eastern, *Tamias striatus*, foraging: the effect of competitors and distance 621
Chipmunks, least, *Tamias minimus*, dynamic averaging of foraging information in 787
Chorthippus brunneus: genetics of songs 399
Choruses of the Pacific treefrog, plasticity and aggression in 633
CHRISTE, P., OPPLIGER, A. & RICHNER, H. Ectoparasite affects choice and use of roost sites in the great tit, *Parus major* 895
Chromis chrysurus, planktivorous reef fish, local prey search based on spatial memory 1413
Cichlasoma nigrofasciatum juveniles; food and defence 91
Cichlids, convict, juvenile, *Cichlasoma nigrofasciatum*; food and defence 91
Cichlids, mouthbrooding, *Oreochromis mossambicus*; male fighting tactics, effects of size and residency 655
Cinclus cinclus: development of foraging behaviour 577
Circa-tidal rhythm entrainment in the rock-pool blenny *Lipophrys pholis* 663
CLAYTON, D. H. & COTGREAVE, P. Relationship of bill morphology to grooming behaviour in birds .. 195
CLAYTON, N. S. The role of age and experience in the behavioural development of food-storing and retrieval in marsh tits, *Parus palustris* 1435
Coalitions, male, in a solitary mongoose 289
COLGAN, P. W., *see* WAAS, J. R.
COLGAN, S., *see* PRENTER, J.
COLLIER, G., *see* JOHNSON, D. F.
Colobus badius and *Pan troglodytes*: a predator–prey system 1135
Colonies of social insects, a method for detecting kin discrimination within 569
Colour polymorphism, female, in damselflies; failure to reject the null hypothesis 1249
Colour, predator, effect on perception and avoidance-learning by prey 1087
Columba livia: cultural transmission is affected by number of tutors and bystanders present .. 331
Columba livia, homing of individuals 821, 833
Competition, interspecific, for nestboxes, affects mate guarding in eastern bluebirds, *Sialia sialis* .. 295
Competition, sexual, and courtship disruptions: male bowerbird marauding 607
Competitors and distance: effect on foraging chipmunks, *Tamias striatus* 621
Conflict, inter-generational, infanticide in skimmers and terns 363
COOK, J. M., RIVERO LYNCH, A. P. & GODFRAY, H. C. J. Sex ratio and foundress number in the parasitoid wasp *Bracon hebetor* 687
COOK, S. E., VERNON, J. G., BATESON, M. & GUILFORD, T. Mate choice in the polymorphic African swallowtail butterfly, *Papilio dardanus*: male-like females may avoid sexual harassment .. 389
COOPER, W. E., JR. Multiple functions of extraoral lingual behaviour in iguanian lizards: prey capture, grooming and swallowing, but not prey detection 765
COOPER, W. E., JR, LÓPEZ, P. & SALVADOR, A. Pheromone detection by an amphisbaenian .. 1401
Cooperative predator inspection in sticklebacks; dynamic analysis 413
Copulation patterns and mate guarding in polyandrous spotted sandpiper 1065
CORDINER, S., *see* MORGAN, E.
Corvus corone corone: time budget variation in relation to flock size 1189
Cost of shivering in owl butterflies 23
Cost, variable, of food procurement, and meal patterns in rats 1278
COTGREAVE, P., *see* CLAYTON, D. H.
COTTON, P. A., *see* WRIGHT, J.
Cottus bairdi: mate choice by females 369
Courtship of the autumn spider, *Metellina segmentata* 449
Courtship disruptions and sexual competition: male bowerbird marauding 607
Courtship song differences in *Drosophila auraria* complex 133
Courtship songs of the picture-winged *Drosophila planitibia* subgroup species 1363
Cowbird, brown-headed, *Molothrus ater*, parasitism; response of forest-interior songbird 275
Crab, *Necora puber*; strategic decisions during agonistic behaviour 885
CRAIG, C. L. Limits to learning: effects of predator pattern and colour on perception and avoidance-learning by prey 1087
CRAIG, M., *see* SIMMONS, L. W.
CREEL, N. M., *see* KEANE, B.
CREEL, S. R., *see* KEANE, B.
CREEL, S. R., *see* WASER, P. M.
CRESSWELL, W. Flocking is an effective anti-predation strategy in redshanks, *Tringa totanus* .. 433
Crickets, field, *Gryllus bimaculatus*, mating behaviour in 857
Crickets, sagebrush, *Cyphoderris strepitans*, male sexual cannibalism and its relation to male mating success in 1171
Crows, carrion, *Corvus corone corone*, time budget variation in relation to flock size 1189

CROWDER, L. B., *see* WILDHABER, M. L.
Cuckoos (Cuculidae), cooperative breeding in the Australian avifauna and brood parasitism by .. 697
Cuckoos, *Guira guira*, genetic relatedness of 515
Cues, chemical, in group member discrimination by *Spermophilus columbianus* 803
Cues, social and environmental, and the mating behaviour of *Gryllus bimaculatus* 857
Cues, temporal, of call recognition in the green treefrog 1073
Cues, visual, in male stickleback rival recognition 7
Cultural transmission in pigeons is affected by the number of tutors and bystanders present .. 331
CURIO, E. Causal and functional questions: how are they linked? 999
Cyphoderris strepitans: sexual cannibalism and its relation to male mating success 1171
DALE, S. & SLAGSVOLD, T. Male pied flycatchers do not choose mates 1197
Damselfish, *Hypsypops rubicundus*, filial cannibalism in 1149
Damselflies, *Enallagma*; female colour polymorphism 1249
DANCHIN, E., *see* CADIOU, B.
DAOUST, J.-L., *see* VICKERY, W. L.
DECOURCY, K. R. & JENSSEN, T. A. Structure and use of male territorial headbob signals by the lizard *Anolis carolinensis* 251
Defence of food by juvenile convict cichlids 91
Defence mechanism, anti-predator; swarm location in zooplankton 175
Defence by neighbours as a responsive amplifier of parental defence in tree swallows 595
Defence, territorial; role of female diana monkeys 425
DESLANDES, I., *see* GIRALDEAU, L.-A.
Desmognathus ochrophaeus survival strategies 1
Detour behaviour in young chicks 123
Developmental stage and filial cannibalism in garibaldi damselfish 1149
DEVENPORT, J. A., *see* DEVENPORT, L. D.
DEVENPORT, L. D. & DEVENPORT, J. A. Time-dependent averaging of foraging information in least chipmunks and golden-mantled ground squirrels 787
Diet preference of grazing sheep; effect of fasting 185
Dipodomys spectabilis: discrimination of footdrumming signatures 45
Dipper, Eurasian, *Cinclus cinclus*, development of foraging behaviour in 577
Discrimination of footdrumming signatures by kangaroo rats, *Dipodomys spectabilis* 45
DNA fingerprinting of guira cuckoos 515
Dominance hierarchy in the ant, *Pachycondyla sublaevis* 179
Dominance, juvenile, in acorn woodpeckers 1121
Dominance rank in sooty mangabeys, *Cercocebus torquatus atys* 589
Dominance, reproductive, in the allodapine bee *Exoneura bicolor* 373
Doves, Barbary, *Streptopelia risoria*, male, sexual assessment in 109
DOWNHOWER, J. F. & LANK, D. B. Effect of previous experience on mate choice by female mottled sculpins 369
DRONEY, D. C. Tests of hypotheses for lek formation in a Hawaiian *Drosophila* 351
Drosophila auraria complex, courtship song differences in 133
Drosophila grimshawi, lek formation in 351
Drosophila planitibia subgroup; courtship songs 1363
Dual status-signalling system in *Urosaurus ornatus* 15
Dynamic averaging of foraging information in least chipmunks and ground squirrels 787
DYSON, M. L., *see* GERHARDT, H. C.
Eclosion, adult, and reproductive dominance in the allodapine bee *Exoneura bicolor* 373
Ectoparasite affects choice and use of roost sites in the great tit, *Parus major* 895
EGGERT, A.-K. & SAKALUK, S. K. Sexual cannibalism and its relation to male mating success in sagebrush crickets, *Cyphoderris strepitans* (Haglidae: Orthoptera) 1171
EIRÍKSSON, T. Song duration and female response behaviour in the grasshopper *Omocestus viridulus* .. 707
ELGAR, M. A., *see* POLANI, A.
ELLIOTT, L. F., *see* KEANE, B.
ELLIOTT, L. F., *see* WASER, P. M.
ELOWSON, A. M. & SNOWDON, C. T. Pigmy marmosets, *Cebuella pygmaea*, modify vocal structure in response to changed social environment 1267
ELWOOD, R., *see* PRENTER, J.
Enallagma damselflies: female colour polymorphism 1249
Energy content and food choice by deer mice 55
Environment, social, changed, *Cebuella pygmaea* marmosets modify vocal structure in response to .. 1267
Environmental cues in the mating behaviour of *Gryllus bimaculatus* 857
Environmental influences on mate location in male chequered skipper butterflies 1179

CONTENTS

Environmental requirements of pigs measured by behavioural demand functions 713
Erithacus rubecula: interaction of body condition and magnetic orientation in autumn migration .. 679
ESPMARK, Y. O., *see* LAMPE, H. M.
EVANS, C. S. & MARLER, P. Food calling and audience effects in male chickens, *Gallus gallus*: their relationships to food availability, courtship and social facilitation 1159
Evolution of conspicuous oestrous advertisement in Old World monkeys 1333
Exoneura bicolor: order of adult eclosion and reproductive dominance 373
Falco tinnunculus, female, gain reproductive success by choosing brightly ornamented males .. 443
Fasting affects intake behaviour and diet preference on grazing sheep 185
Fat load and magnetic orientation in autumn migrating robins, *Erithacus rubecula* 679
Father chosen as song tutor by male zebra finches 671
Father presence, influence on juvenile prairie voles, *Microtus ochrogaster* 281
Feeding behaviour and prey choice of the threespine stickleback 921
Feeding nestlings, contribution of helpers to, in grey-capped social weavers 1047
Female aggression and mate choice in the blue tit 943
Female choice repeatability in a monogamous swallow 643
Female colour polymorphism in damselflies: failure to reject the null hypothesis 1249
Female diana monkeys, role in territorial defence 425
Female kestrels gain reproductive success by choosing brightly ornamented males 443
Female lions, roaring and assessment in contests between groups 379
Females, male-like, *Papilio dardanus* 389
Female mate choice in the grey treefrog, reproductive character displacement of 959
Female meadow voles, role in regulating male interactions with pups 1037
Female mottled sculpins, mate choice by 369
Females, pronghorn, choose vigorous mates 33
Female response behaviour and song duration in the grasshopper *Omocestus viridulus* 707
Female role in sperm competition in the chaffinch 163
Female social and mating preferences in the monogamous California mouse, *Peromyscus californicus* 559
Female song preference in *Chorthippus brunneus*; genetic variation 399
Female treefrogs and calls; mechanisms of mate choice 1323
FENTON, M. B. Assessing signal variability and reliability: 'to thine ownself be true' 757
FETHERSTON, I. A., SCOTT, M. P. & TRANIELLO, J. F. A. Behavioural compensation for mate loss in the burying beetle *Nicrophorus orbicollis* 777
Ficedula hypoleuca males do not choose mates 1197
Ficedula hypoleuca: song structure reflects male quality 869
Fighting by silvereyes; variation in initiator strategy 153
Fighting tactics of male mouthbrooding cichlids: the effects of size and residency 655
Filial cannibalism in garibaldi damselfish 1149
Finches, zebra, *Taeniopygia guttata*: what causes young males to choose their father as song tutor? .. 671
FINCKE, O. M. Female colour polymorphism in damselflies: failure to reject the null hypothesis .. 1249
Flies, fruit, Hawaiian, *Drosophila grimshawi*, lek formation in 351
Flock size and time budget variation in carrion crows 1189
Flocking as anti-predation strategy in redshanks 433
Flower morphology and bumble bee learning 531
Flycatchers, pied, *Ficedula hypoleuca*, song structure reflects male quality in 869
Flycatchers, pied, male, do not choose mates 1197
Food-associated calls in cotton-top tamarins 263
Food calling by male chickens 1159
Food choice by deer mice, effect of energy and protein content 55
Food procurement cost, variable, and meal patterns, in rats 1278
Food, spatial predictability, and defence; juvenile convict cichlids 91
Food-storing and retrieval in marsh tits, *Parus palustris*, role of age and experience in behavioural development of 1435
Footdrumming discrimination in kangaroo rats 45
Foraging behaviour development in the Eurasian dipper, *Cinclus cinclus* 577
Foraging eastern chipmunks, *Tamias striatus*, effect of competitors and distance on 621
Foraging information, dynamic averaging of, in least chipmunks and ground squirrels 787
Foraging and patch giving-up times in bluegill sunfish 501
Foraging, risk-sensitive, in honey bees: no consensus among individuals and no effect of colony honey stores 933
Foundress number and sex ratio in the parasitoid wasp *Bracon hebetor* 687
Fringilla coelebs: role of the female in sperm competition 163

Functional and causal questions: how are they linked? 999
Gallus gallus, male, food calling and audience effects in 1159
Gallus gallus domesticus: detour behaviour in young chicks 123
Gallus gallus domesticus: social learning in small flocks of laying hens 1289
Gasterosteus aculeatus: dynamic analysis of predator inspection 413
Gasterosteus aculeatus: feeding behaviour and prey choice 921
Gasterosteus aculeatus, male, rival recognition in 7
Gasterosteus aculeatus: swarm location in zooplankton as an anti-predator defence mechanism .. 175
Geese, snow, lesser, *Chen caerulescens caerulescens*: adoption 101
Genetic relatedness of communally breeding guira cuckoos 515
Genetic variation in male song and female song preference in the grasshopper *Chorthippus brunneus*.. 399
GÉRARD, D., BAUCHAU, V. & SMETS, S. Reduced trappability in wild mice, *Mus musculus domesticus*, heterozygous for Robertsonian translocations 877
GERHARDT, H. C. Reproductive character displacement of female mate choice in the grey treefrog, *Hyla chrysoscelis* 959
GERHARDT, H. C., DYSON, M. L., TANNER, S. D. & MURPHY, C. G. Female treefrogs do not avoid heterospecific calls as they approach conspecific calls: implications for mechanisms of mate choice.. 1323
GILL, A. B. & HART, P. J. B. Feeding behaviour and prey choice of the threespine stickleback: the interacting effects of prey size, fish size and stomach fullness 921
GIRALDEAU, L.-A., KRAMER, D. L., DESLANDES, I. & LAIR, H. The effect of competitors and distance on central place foraging eastern chipmunks, *Tamias striatus* 621
GIRALDEAU, L.-A., *see* LEFEBVRE, L.
Glance rate in young baboons, *Papio cynocephalus* 749
GODFRAY, H. C. J., *see* COOK, J. M.
GORDON, T. P., *see* GUST, D. A.
GOULSON, D., BIRCH, M. C. & WYATT, T. D. Mate location in the deathwatch beetle, *Xestobium rufovillosum* De Geer (Anobiidae): orientation to substrate vibrations 899
GRAND, T. C. & GRANT, J. W. A. Spatial predictability of food influences its monopolization and defence by juvenile convict cichlids 91
GRANT, J. W. A., *see* GRAND, T. C.
Grasshoppers, *Chorthippus brunneus*, genetics of songs 399
Grasshoppers, *Omocestus viridulus*, song duration and female response behaviour in 707
GREEN, R. F., *see* WILDHABER, M. L.
Grooming behaviour and bill morphology in birds 195
Group member discrimination by Columbian ground squirrels 803
Grouse, sage, *Centrocercus urophasianus*, lek behaviour in 303
Gryllus bimaculatus mating behaviour 857
Guarding, mate, and copulation patterns in the spotted sandpiper 1065
Guarding, mate, in eastern bluebirds, is affected by competition for nestboxes 295
GUBERNICK, D. J. & ADDINGTON, R. L. The stability of female social and mating preferences in the monogamous California mouse, *Peromyscus californicus* 559
GUILFORD, T., *see* COOK, S. E.
Guira guira cuckoos, genetic relatedness of.. 515
GUSHIMA, K., *see* NODA, M.
GUST, D. A. & GORDON, T. P. The absence of a matrilineally based dominance system in sooty mangabeys, *Cercocebus torquatus atys* 589
Habitat: effect on glance rate in young baboons 749
HAHN, T. P., *see* WINGFIELD, J. C.
HAGIWARA, T., *see* TOKIDA, E.
HAKKARAINEN, H., *see* PALOKANGAS, P.
HALL, N., *see* BYERS, J. A.
Handling, non-trivial, in free-living cheetahs, monitoring the effects of.. 547
HARE, J. F. Group member discrimination by Columbian ground squirrels via familiarity with substrate-borne chemical cues 803
HART, P. J. B., *see* GILL, A. B.
HARVEY, A., *see* NEWMAN, J. A.
Headbob signals by the lizard *Anolis carolinensis* 251
Helogale parvula: subordinate reproduction 65
Helper contributions in feeding nestlings in grey-capped social weavers 1047
Hens, *Gallus gallus domesticus*, laying; social learning in small flocks 1289
Herpestes sanguineus: possible male coalitions 289
HERSEK, M. J., *see* BOELLSTORFF, D. E.

CONTENTS

HEWITT, G. M., *see* CHARALAMBOUS, M.
HEYES, C. C. Reflections on self-recognition in primates 909
HIGASHI, S., ITO, F., SUGIURA, N. & OHKAWARA, K. Worker's age regulates the linear dominance hierarchy in the queenless ponerine ant, *Pachycondyla sublaevis* (Hymenoptera: Formicidae) 179
HILEMAN, K. S. & BRODIE, E. D., JR. Survival strategies of the salamander *Desmognathus ochrophaeus*: interaction of predator-avoidance and anti-predator mechanisms 1
HILL, C. M. The role of female diana monkeys, *Cercopithecus diana*, in territorial defence .. 425
Hirundo rustica, monogamous, repeatability of female choice in 643
Hoarding: separation of caches between individual willow tits 1031
HOIKKALA, A., KANESHIRO, K. Y. & HOY, R. R. Courtship songs of the picture-winged *Drosophila planitibia* subgroup species 1363
Homing of individual *Columba livia* pigeons 821, 833
HOSKEN, D., *see* SIMMONS, L. W.
Host size experience, effects on sex ratios in *Spalangia cameroni* 815
HOY, R. R., *see* ADAMO, S. A.
HOY, R. R., *see* HOIKKALA, A.
HUHTA, E., *see* PALOKANGAS, P.
HUNTINGFORD, F. A., LAZARUS, J., BARRIE, B. D. & WEBB, S. A dynamic analysis of cooperative predator inspection in sticklebacks 413
HUNTINGFORD, F. A., *see* SMITH, I. P.
HUPP, J. W., *see* YOUNG, J. R.
HUTCHISON, J. B., *see* LOVARI, S.
HUTCHISON, R. E., *see* LOVARI, S.
Hyla chrysoscelis: reproductive character displacement of female mate choice 959
Hyla cinerea: temporal features mediating call recognition; amplitude modulation 1073
Hyla regilla: behavioural plasticity mediates aggression in choruses 633
Hypsypops rubicundus: filial cannibalism 1149
Iguana, green, *Iguana iguana*, sexual bimaturism in 1101
Iguana iguana: sexual bimaturism 1101
Infanticide in skimmers and terns 363
Initiator strategy variation in fighting by silvereyes 153
Insects, social, a method for detecting kin discrimination within natural colonies of 569
ITO, F., *see* HIGASHI, S.
JAKOBSEN, P. J., BIRKELAND, K. & JOHNSEN, G. H. Swarm location in zooplankton as an anti-predator defence mechanism 175
JAMON, M. An analysis of trail-following behaviour in the wood mouse, *Apodemus sylvaticus* .. 1127
JENSSEN, T. A., *see* DECOURCY, K. R.
JOHNSEN, G. H., *see* JAKOBSEN, P. J.
JOHNSON, D. F. & COLLIER, G. Meal patterns of rats encountering variable food procurement cost .. 1278
JOYCE, T. L., *see* STOREY, A. E.
Junco hyemalis, effects of testosterone on spatial activity in males 1445
Juvenile dominance in acorn woodpeckers 1121
Juvenile prairie voles, *Microtus ochrogaster*, alloparental care and the influence of father presence .. 281
KAKUNDA, S., *see* NODA, M.
KANESHIRO, K. Y., *see* HOIKKALA, A.
KATZIR, G., *see* WEIHS, D.
KEANE, B., WASER, P. M., CREEL, S. R., CREEL, N. M., ELLIOTT, L. F. & MINCHELLA, D. J. Subordinate reproduction in dwarf mongooses 65
KEANE, B., *see* WASER, P. M.
KEMPENAERS, B. Polygyny in the blue tit: unbalanced sex ratio and female aggression restrict mate choice 943
Kestrels, *Falco tinnunculus*, female, and reproductive success of choosing brightly ornamented males .. 443
KETTERSON, E. D., *see* CHANDLER, C. R.
KIEPENHEUER, J., *see* WALLRAFF, H. G.
Kin discrimination detection within natural colonies of social insects 569
KING, B. H. Effects of host size experience on sex ratios in the parasitoid wasp *Spalangia cameroni* .. 815
Kittiwake, *Rissa tridactyla*, prospecting in 847
KORPIMÄKI, E., *see* PALOKANGAS, P.
KRAMER, D. L., *see* GIRALDEAU, L.-A.
KRISHNAN, V. V., *see* STAMPS, J. A.
LADEWIG, J., *see* MATTHEWS, L. R.
LAIR, H., *see* GIRALDEAU, L.-A.

LAMPE, H. M. & ESPMARK, Y. O. Song structure reflects male quality in pied flycatchers, *Ficedula hypoleuca* 869
LANK, D. B., *see* DOWNHOWER, J. F.
LAURENSON, M. K. & CARO, T. M. Monitoring the effects of non-trivial handling in free-living cheetahs 547
LAVERTY, T. M. Bumble bee learning and flower morphology 531
LAZARUS, J., *see* HUNTINGFORD, F. A.
Learning, bumble bee, and flower morphology 531
Learning, limits to; effects of predator pattern and colour on perception and avoidance-learning by prey 1087
Learning, social, in small flocks of laying hens 1289
LEFEBVRE, L. & GIRALDEAU, L.-A. Cultural transmission in pigeons is affected by the number of tutors and bystanders present 331
Lek behaviour in captive sage grouse *Centrocercus urophasianus* 303
Lek formation in Hawaiian *Drosophila grimshawi* 351
LEMON, R. E., PERREAULT, S. & WEARY, D. M. Dual strategies of song development in American redstarts, *Setophaga ruticilla* 317
Lepomis macrochirus continuously update patch giving-up times based on foraging experience .. 501
LINDEN, M., *see* MORENO, J.
Lions, *Panthera leo*, female, roaring and assessment in contests between groups 379
Lipophrys pholis, entrainment of a circa-tidal rhythm in, by simulated wave action 663
Lizards, *Anolis aeneus*; territory acquisition 1375, 1387
Lizards, *Anolis carolinensis*, male headbob signals by 251
Lizards, iguanian; multiple functions of extraoral lingual behaviour 765
Lizards, tree, *Urosaurus ornatus*; a dual status-signalling system 15
LLORENS, T., *see* SIMMONS, L. W.
LÓPEZ, P., *see* COOPER, W. E., JR
LOVARI, S., HUTCHISON, R. E. & HUTCHISON, J. B. Sexual assessment in the male dove: behavioural and physiological effects of choice without interaction 109
Macaca fuscata: tool-using, use of stones to obtain fruit from a pipe 1023
Macaques, Japanese, *Macaca fuscata*, tool-using in; use of stones to obtain fruit from a pipe .. 1023
MCCOMB, K., PACKER, C. & PUSEY, A. Roaring and numerical assessment in contests between groups of female lions, *Panthera leo* 379
MACEDO, R., *see* QUINN, J. S.
Male bowerbirds: why do they destroy each other's bowers? 607
Male chequered skipper butterflies, environmental influences on 1179
Male chickens, food calling and audience effects in 1159
Male coalitions in a solitary mongoose 289
Male dove, sexual assessment in 109
Male headbob signals by the lizard *Anolis carolinensis* 251
Male *Junco hyemalis*: effect of testosterone on spatial activity 445
Male kestrels, brightly ornamented, chosen by females; reproductive success 443
Male mate choice in the bushcricket 117
Male mating success and sexual cannibalism in sagebrush crickets 1171
Male mating tactics in the scorpionfly 203
Male meadow voles, nest attendance in; role of female in regulating male interactions with pups .. 1037
Male mouthbrooding cichlids: fighting tactics, effects of size and residency 655
Male pied flycatchers do not choose mates 1197
Male quality is reflected in song structure in pied flycatchers 869
Male song and female song preference in *Chorthippus brunneus*, genetic variation in 399
Male sticklebacks, rival recognition in 7
Male zebra finches: choice of father as song tutor 671
Mangabeys, sooty, *Cercocebus torquatus atys*, dominance rank in 589
MANLY, B. F. J., *see* SPURRIER, M. F.
MANN, N. I. & SLATER, P. J. B. What causes young male zebra finches, *Taeniopygia guttata*, to choose their father as song tutor? 671
MARK, D. & STUTCHBURY, B. J. Response of a forest-interior songbird to the threat of cowbird parasitism 275
MARLER, P., *see* EVANS, C. S.
Marmosets, *Cebuella pygmaea*, modify vocal structure in response to changes in social environment .. 1267
Mate choice in the blue tit 943
Mate choice, female, in the grey treefrog, reproductive character displacement of 959
Mate choice by female mottled sculpins 369

CONTENTS

Mate choice as information gathering process under time constraint 141
Mate choice, male, in the bushcricket 117
Mate choice mechanisms; female treefrogs and calls 1323
Mate choice in the polymorphic African swallowtail butterfly, *Papilio dardanus* 389
Mate choice by pronghorn females 33
Mates are not chosen by male pied flycatchers 1197
Mate guarding and copulation patterns in the spotted sandpiper 1065
Mate guarding in eastern bluebirds, *Sialia sialis*, is affected by competition for nestboxes .. 295
Mate location in the deathwatch beetle, *Xestobium rufovillosum*: orientation to substrate vibrations .. 899
Mate location in male chequered skipper butterflies 1179
Mate loss, behavioural compensation for, in the burying beetle 777
Maternal rank: effect on glance rate in young baboons 749
Mating behaviour of the field cricket *Gryllus bimaculatus* 857
Mating preferences in the monogamous California mouse, *Peromyscus californicus* 559
Mating success, male, and sexual cannibalism in sagebrush crickets 1171
Mating tactics, male, in the scorpionfly 203
MATTHEWS, L. R. & LADEWIG, J. Environmental requirements of pigs measured by behavioural demand functions 713
MAXSON, S. J., *see* ORING, L. W.
MAYNARD SMITH, J. Must reliable signals always be costly? 1115
Meal patterns of rats encountering variable food procurement cost 1278
MEEK, S. B. & ROBERTSON, R. J. Interspecific competition for nestboxes affects mate guarding in eastern bluebirds, *Sialia sialis* 295
Melanerpes formicivorus: juvenile dominance 1121
Melospiza melodia morphna: testosterone and territorial behaviour 77
Memory, spatial, local prey search based on, in *Chromis chrysurus* 1413
Memory, spatial, and searching efficiency 1423
Metellina segmentata: courtship and mating 449
Mice, deer, *Peromyscus maniculatus*, effect of energy and protein content on food choice 55
Mice, monogamous, California, *Peromyscus californicus*, female social and mating preferences in .. 559
Mice, wild, *Mus musculus domesticus*, trappability in 877
Mice, wood, *Apodemus sylvaticus*, trail-following behaviour in 1127
Microtus ochrogaster: alloparental care and the influence of father presence on juveniles 281
Microtus pennsylvanicus: nest attendance in males; female role in regulating male interactions with pups 1037
Migrating robins, *Erithacus rubecula*, interaction of body condition and magnetic orientation in .. 679
Migratory sparrows, testosterone and territorial behaviour in 77
MINCHELLA, D. J., *see* KEANE, B.
MINCHELLA, D. J., *see* WASER, P. M.
MØLLER, A. P. Repeatability of female choice in a monogamous swallow 643
MØLLER, A. P., *see* MORENO, J.
Molothrus ater parasitism, response of forest-interior songbird 275
Mongooses, dwarf, *Helogale parvula*, subordinate reproduction in 65
Mongooses, *Herpestes sanguineus*, solitary; possible male coalitions 289
Monkeys, *Cercopithecus diana*, female; role in territorial defence 425
Monkeys, colobus, red, *Colobus badius*, and chimpanzees: a predator–prey system 1135
Monkeys, Old World, evolution of oestrous advertisement in 1333
MONNAT, J. Y., *see* CADIOU, B.
MOODIE, J. D., *see* BYERS, J. A.
MORENO, J., SOLER, M., MØLLER, A. P. & LINDEN, M. The function of stone carrying in the black wheatear, *Oenanthe leucura* 1297
MORGAN, E. & CORDINER, S. Entrainment of a circa-tidal rhythm in the rock-pool blenny *Lipophrys pholis* by simulated wave action 663
Morphology, bill, and grooming behaviour in birds 195
MORRIS, R. D., *see* QUINN, J. S.
MURPHY, C. G., *see* GERHARDT, H. C.
Mus musculus domesticus, reduced trappability in 877
Necora puber: strategic decisions during agonistic behaviour 885
Nectar collecting and processing in honey bee colonies 311
Neighbours, defence by, in tree swallows 595
Neighbours: role in territorial systems 339
Nest attendance in male meadow voles: role of the female in regulating male interactions with pups .. 1037
Nestbox interspecific competition affects mate guarding in eastern bluebirds, *Sialia sialis* 295

Nestlings, feeding, helper contribution to, in grey-capped social weavers 1047
NEWMAN, J. A., PENNING, P. D., PARSONS, A. J., HARVEY, A. & ORR, R. J. Fasting affects intake behaviour and diet preference of grazing sheep 185
NICOL, C. J. & POPE, S. J. Social learning in small flocks of laying hens 1289
Nicrophorus orbicollis: behavioural compensation for mate loss 777
NODA, M., GUSHIMA, K. & KAKUDA, S. Local prey search based on spatial memory and expectation in the planktivorous reef fish, *Chromis chrysurus* (Pomacentridae) 1413
NOLAN, V., JR, *see* CHANDLER, C. R.
NOVAK, M. A., *see* WANG, Z.
Oenanthe leucura: function of stone carrying 1297
Oestrous advertisement, evolution of, in Old World monkeys 1333
OGUMA, Y., *see* TOMARU, M.
OHKAWARA, K., *see* HIGASHI, S.
Omocestus viridulus: song duration and female response behaviour 707
OPPLIGER, A., *see* CHRISTE, P.
Opsiphanes: shivering and its cost during reproductive behaviour 23
Oreochromis mossambicus: fighting tactics of males 655
Orientation and homing of individual pigeons 821
Orientation, magnetic, and body condition in autumn migrating robins, *Erithacus rubecula* .. 679
Orientation to substrate vibrations; mate location in *Xestobium rufovillosum* 899
ORING, L. W., REED, J. M. & MAXSON, S. J. Copulation patterns and mate guarding in the sex-role reversed, polyandrous spotted sandpiper, *Actitis macularia* 1065
Ornamented male kestrels chosen by females; reproductive success 443
ORR, R. J., *see* NEWMAN, J. A.
Ovis aries, grazing, effect of fasting on diet preference 185
OWINGS, D. H., *see* BOELLSTORFF, D. E.
Pachycondyla sublaevis: dominance hierarchy 179
PACKER, C., *see* MCCOMB, K.
PAGEL, M. The evolution of conspicuous oestrous advertisement in Old World monkeys 1333
PALOKANGAS, P., KORPIMÄKI, E., HAKKARAINEN, H., HUHTA, E., TOLONEN, P. & ALATALO, R. V. Female kestrels gain reproductive success by choosing brightly ornamented males .. 443
Pan troglodytes and *Colobus badius*: a predator–prey system 1135
Panorpa vulgaris: male mating tactics 203
Panthera leo, female, roaring and assessment in contests between groups 379
Papio cynocephalus, young, vigilance in; glance rate 749
Papilio dardanus, mate choice in 389
Parasitism, cowbird, response of forest-interior songbird 275
Parental care: experimentally induced sex differences in starlings 1311
PARSONS, A. J., *see* NEWMAN, J. A.
Parus caeruleus, polygyny in 943
Parus major: ectoparasite affects choice and use of roost sites 895
Parus montanus: separation of caches between individual willow tits hoarding under natural conditions 1031
Parus palustris, role of age and experience in behavioural development of food-storing and retrieval .. 1435
Patch giving-up times in bluegill sunfish 501
Paternity certainty; experimentally induced sex differences and parental care in starlings 1311
Paternity, multiple, and reproductive behaviour of California ground squirrels 1057
Pattern, predator, effect on perception and avoidance-learning by prey 1087
PELTIER, J., *see* VICKERY, W. L.
PENEDO, M. C. T., *see* BOELLSTORFF, D. E.
PENNING, P. D., *see* NEWMAN, J. A.
Peromyscus californicus: stability of female social and mating preferences in 559
Peromyscus maniculatus: energy and protein content in food choice 55
PERREAULT, S., *see* LEMON, R. E.
Phenotypic divergence of secondary sexual traits among sage grouse 1353
Pheromone detection by an amphisbaenian 1401
PHILLIPS, J. A., *see* PRATT, N. C.
Picture-winged *Drosophila planitibia* subgroup; courtship songs 1363
Pigs, *Sus scrofa*: environmental requirements measured by behavioural demand functions .. 713
Pigeons, *Columba livia*; cultural transmission is affected by number of tutors and bystanders present .. 331
Pigeons, *Columba livia*, individual, homing of 821, 833
Planktivorous reef fish, *Chromis chrysurus*, local prey search based on spatial memory and expectation 1413

CONTENTS

Plasticity, behavioural, mediates aggression in choruses of the Pacific treefrog 633
Platalea leucordia: hydrodynamic function of bill sweeping 649
POLANI, A. & ELGAR, M. A. Cooperative breeding in the Australian avifauna and brood parasitism by cuckoos (Cuculidae) 697
Polyandrous spotted sandpiper, copulation patterns and mate guarding in 1065
Polygyny in the blue tit 943
Polymorphism, colour, female, in damselflies 1249
POPE, S. J., *see* NICOL, C. J.
PRATT, N. C., PHILLIPS, J. A., ALBERTS, A. C. & BOLDA, K. S. Functional versus physiological puberty: an analysis of sexual bimaturism in the green iguana, *Iguana iguana* 1101
Predator inspection in sticklebacks; dynamic analysis 413
Predator pattern and colour, effect on perception and avoidance-learning by prey 1087
PRENTER, J., ELWOOD, R. & COLGAN, S. The influence of prey size and female reproductive state on the courtship of the autumn spider, *Metellina segmentata*: a field experiment 449
Prey chemicals, lizard response to 765
Prey choice of the threespine stickleback 921
Prey, effects of predator pattern and colour on perception and avoidance-learning by 1087
Prey search based on spatial memory and expectation in *Chromis chrysurus* 1413
Prey size, influence on courtship of *Metallina segmentata* 449
Primates, self-recognition in 909
Pronghorn, *Antilocapra americana*; mate choice by females 33
Prospecting in the kittiwake, *Rissa tridactyla* 847
Protein content and food choice by deer mice 55
PRUETT-JONES, S. & PRUETT-JONES, M. Sexual competition and courtship disruptions: why do male bowerbirds destroy each other's bowers? 607
PRUETT-JONES, M., *see* PRUETT-JONES, S.
Pseudonigrita arnaudi: contribution of helpers to feeding nestlings 1047
PUSEY, A., *see* MCCOMB, K.
Pygmy marmosets, *Cebuella pygmaea*, modify vocal structure in response to changed social environment 1267
QUELLER, D. C. A method for detecting kin discrimination within natural colonies of social insects.. 569
QUINN, J. S., MACEDO, R. & WHITE, B. N. Genetic relatedness of communally breeding guira cuckoos 515
QUINN, J. S., WHITTINGHAM, L. A. & MORRIS, R. D. Infanticide in skimmers and terns: side effects of territorial attacks or inter-generational conflict? 363
RANDALL, J. A. Discrimination of footdrumming signatures by kangaroo rats, *Dipodomys spectabilis*.. 45
Rats, kangaroo, *Dipodomys spectabilis*; discrimination of footdrumming signatures 45
Rats, *Rattus norvegicus*, encountering variable food procurement cost; meal patterns 1278
Rattus norvegicus: meal patterns and variable food procurement cost 1278
RAVENSCROFT, N. O. M. Environmental influences on mate location in male chequered skipper butterflies, *Carterocephalus palaemon* (Lepidoptera: Hesperiidae) 1179
Recognition, call, temporal cues of, in the green treefrog 1073
Recognition, group member, by Columbian ground squirrels 803
Recognition of rivals in *Gasterosteus aculeatus* males 7
Recognition, self-, in primates 909
Redshanks, *Tringa totanus*, flocking as anti-predation strategy 433
Redstarts, American, *Setophaga ruticilla*, dual strategies of song development in 317
REED, J. M., *see* ORING, L. W.
REGOLIN, L., VALLORTIGARA, G. & ZANFORLIN, M. Perceptual and motivational aspects of detour behaviour in young chicks 123
Reproductive behaviour and multiple maternity of California ground squirrels 1057
Reproductive behaviour in owl butterflies, shivering and its cost during 23
Reproductive character displacement of female mate choice in the grey treefrog, *Hyla chrysoscelis* .. 959
Reproductive success of female kestrels choosing brightly ornamented males 443
Requena verticalis: male mate choice 117
Resource dependence of male mating tactics in the scorpionfly 203
RICHNER, H., *see* CHRISTIE, P.
Risk-sensitive foraging in honey bees: no consensus among individuals and no effect of colony honey stores 933
Rissa tridactyla, prospecting in 847
Rival recognition by male sticklebacks 7
RIVERO LYNCH, A. P., *see* COOK, J. M. 687
Roaring and assessment in contests between groups of female lions, *Panthera leo* 379

ROBERTSON, R. J., *see* MEEK, S. B.
Robertsonian mice trappability 877
Robins, *Erithacus rubecula*, migrating, interaction of body condition and magnetic orientation in .. 679
Roost sites, ectoparasite affects choice and use of, in the great tit, *Parus major* 895
ROSE, G. J., *see* BRENOWITZ, E. A.
ROUSH, R. S. & SNOWDON, C. T. Ontogeny of food-associated calls in cotton-top tamarins .. 263
Rynchops niger, infanticide in 363
Sage grouse, *Centrocercus urophasianus*; phenotypic divergence of secondary sexual traits .. 1353
Saguinus oedipus oedipus: ontogeny of food-associated calls 263
SAINO, N. Time budget variation in relation to flock size in carrion crows, *Corvus corone corone* .. 1189
SAKALUK, S. K., *see* EGGERT, A.-K.
Salamander, *Desmognathus ochrophaeus*, survival strategies of 1
SALVADOR, A., *see* COOPER, W. E., JR
SANDBERG, R. Interaction of body condition and magnetic orientation in autumn migrating robins, *Erithacus rubecula* 679
Sandpipers, spotted, *Actitis macularia*, copulation patterns and mate guarding 1065
SAUER, K. P., *see* BOCKWINKEL, G.
SCHINZIG, M., *see* SIMMONS, L. W.
SCHWARZ, M. P. & WOODS, R. E. Order of adult eclosion is a major determinant of reproductive dominance in the allodapine bee *Exoneura bicolor* 373
Scorpionfly, *Panorpa vulgaris*; male mating tactics 203
SCOTT, M. P., *see* FETHERSTON, I. A.
Sculpins, mottled, *Cottus bairdi*, mate choice by females 369
Search time: why it is an accurate cue for honey bees 311
Searching efficiency and spatial memory 1423
Sedentary sparrows, testosterone and territorial behaviour in 77
SEELEY, T. D. & TOVEY, C. A. Why search time to find a food-storer bee accurately indicates the relative rates of nectar collecting and nectar processing in honey bee colonies 311
Self-recognition in primates 909
Setophaga ruticilla: dual strategies of song development 317
Sex differences, experimentally induced, in parental care: an effect of certainty of paternity? .. 1311
Sex: effect on glance rate in young baboons 749
Sex ratio and foundress number in the parasitoid wasp *Bracon hebetor* 687
Sex ratios in *Spalangia cameroni*, effects of host size experiences on 815
Sex ratio, unbalanced, and mate choice in the blue tit 943
Sexual assessment in the male dove 109
Sexual bimaturism in the green iguana 1101
Sexual cannibalism and its relation to male mating success in sagebrush crickets 1171
Sexual competition and courtship disruptions: male bowerbird marauding 607
Sexual traits among sage grouse populations; phenotypic divergence 1353
Sheep, grazing, *Ovis aries*, fasting and diet preference 185
SHELDON, B. C. Sperm competition in the chaffinch: the role of the female 163
Shivering and its cost in owl butterflies 23
Sialia sialis: competition for nestboxes affects mate guarding 295
Signal design and mate choice under time constraint 141
Signals, headbob, by the lizard *Anolis carolinensis* 251
Signals, reliable, must they always be costly? 1115
Signal variability and reliability; bat calls 757
SIKKEL, P. C. Filial cannibalism in a paternal-caring marine fish: the influence of egg developmental stage and position in the nest 1149
Silvereyes, *Zosterops lateralis*, initiator strategy variation in fighting 153
SIMMONS, A. M., *see* ALLAN, S. E.
SIMMONS, L. W., LLORENS, T., SCHINZIG, M., HOSKEN, D. & CRAIG, M. Sperm competition selects for male mate choice and protandry in the bushcricket, *Requena verticalis* (Orthoptera: Tettigoniidae) 117
Size: feeding behaviour and prey choice of the threespine stickleback 921
Size: effects in fighting tactics of male mouthbrooding cichlids 655
Size of flock, time budget variation in relation to, in carrion crows 1189
Size, prey, influence on courtship of *Metellina segmentata* 449
Skimmers, black, *Rynchops niger*, infanticide in 363
SLAGSVOLD, T., *see* DALE, S.
SLATER, P. J. B., *see* MANN, N. I.
SMETS, S., *see* GÉRARD, D.

CONTENTS

SMITH, I. P., HUNTINGFORD, F. A., ATKINSON, R. J. A. & TAYLOR, A. C. Strategic decisions during agonistic behaviour in the velvet swimming crab, *Necora puber* (L.) 885
SNOWDON, C. T., *see* ELOWSON, A. M.
SNOWDON, C. T., *see* ROUSH, R. S.
Social cues in the mating behaviour of *Gryllus bimaculatus* 857
Social environment, changed, *Cebuella pygmaea* marmosets modify vocal structure in response to .. 1267
Social insects, a method for detecting kin discrimination within natural colonies of 569
Social learning in small flocks of laying hens 1289
Social and mating preferences in the monogamous California mouse, *Peromyscus californicus* .. 559
Social and spatial relationships; territory acquisition in lizards 1387
SOLER, M., *see* MORENO, J.
Songs, *Chorthippus brunneus*, genetics of 399
Song, courtship, differences in the *Drosophila auraria* complex 133
Songs, courtship, of the picture-winged *Drosophila planitibia* subgroup.. 1363
Song development, dual strategies of, in American redstarts, *Setophaga ruticilla*.. 317
Song duration and female response behaviour in the grasshopper *Omocestus viridulus* 707
Song perception in the song sparrow 1343
Song structures reflects male quality in pied flycatchers 869
Song tutor, father chosen as, by male zebra finches 671
Songbird, forest-interior, hooded warbler, *Wilsonia citrina*; response to threat of cowbird parasitism.. 275
Spalangia cameroni: effects of host size experience on sex ratios 815
Sparrows, *Melospiza melodia morphna*, testosterone and territorial behaviour 77
Sparrows, white-crowned, *Zonotrichia leucophrys pugetensis*, testosterone and territorial behaviour.. 77
Spatial activity in male *Junco hyemalis*; effect of testosterone 1445
Spatial memory, local prey search based on, in *Chromis chrysurus* 1413
Spatial memory and searching efficiency 1423
Spatial predictability of food; defence by juvenile convict cichlids 91
Spatial relationships; territory acquisition in lizards 1387
Sparrow, song, perception of song in 1343
Sperm competition selects for male mate choice and protandry in the bushcricket 117
Sperm competition in the chaffinch; role of female 163
Spermophilus beecheyi: reproductive behaviour and multiple paternity 1057
Spermophilus columbianus group member discrimination; chemical cues 803
Spermophilus lateralis: dynamic averaging of foraging information 787
Spider, autumn, *Metellina segmentata*, courtship and mating 449
Spoonbill, *Platalea leucordia*, hydrodynamic function of bill sweeping 649
SPURRIER, M. F., BOYCE, M. S. & MANLY, B. F. J. Lek behaviour in captive sage grouse *Centrocercus urophasianus* 303
Squatting; prospecting in the kittiwake, *Rissa tridactyla* 847
Squirrels, ground, California, *Spermophilus beecheyi*, reproductive behaviour and multiple maternity.. 1057
Squirrels, ground, Columbian, *Spermophilus columbianus*; group member recognition and chemical cues 803
Squirrels, ground, golden-mantled, *Spermophilus lateralis*; dynamic averaging of foraging information 787
SRYGLEY, R. B. Shivering and its costs during reproductive behaviour in Neotropical owl butterflies, *Caligo* and *Opsiphanes* (Nymphalidae: Brassolinae) 23
STAMPS, J. A. & KRISHNAN, V. V. Territory acquisition in lizards: I. First encounters 1375
STAMPS, J. A. & KRISHNAN, V. V. Territory acquisition in lizards: II. Establishing social and spatial relationships 1387
STANBACK, M. T. Dominance within broods of the cooperatively breeding acorn woodpecker .. 1121
Starlings, European, *Sturnus vulgaris*; experimentally induced sex differences in parental care .. 1311
Status-signalling system, dual, in *Urosaurus ornatus* 15
Sterna hirundo, infanticide in 363
Sticklebacks, three-spined, *Gasterosteus aculeatus*, dynamic analysis of predator inspection .. 413
Sticklebacks, three-spined, *Gasterosteus aculeatus*; feeding behaviour and prey choice 921
Sticklebacks, three-spined, *Gasterosteus aculeatus*, rival recognition in 7
Sticklebacks, three-spined, *Gasterosteus aculeatus*; swarm location in zooplankton as an anti-predator defence mechanism 175
Stomach fullness; feeding behaviour and prey choice of the threespine stickleback 921
Stone carrying, function of, in the black wheatear, *Oenanthe leucura* 1297
Stones used by *Macaca fuscata* to obtain fruit from a pipe 1023
STOREY, A. E., BRADBURY, C. G. & JOYCE, T. L. Nest attendance in male meadow voles: the role of the female in regulating male interactions with pups 1037

Strategic decisions during agonistic behaviour in the velvet swimming crab, *Necora puber* .. 885
Streptopelia risoria: sexual assessment in the male 109
Sturnus vulgaris: experimentally induced sex differences in paternal care 1311
STUTCHBURY, B. J., *see* MARK, D.
Subordinate reproduction in dwarf mongooses 65
SUGIURA, N., *see* HIGASHI, S.
SULLIVAN, M. S. Mate choice as an information gathering process under time constraint: implications for behaviour and signal design 141
Survival strategies of the salamander *Desmognathus ochrophaeus* 1
Sus scrofa: environmental requirements measured by behavioural demand functions 713
Swallows, barn, *Hirundo rustica*, monogamous, repeatability of female choice in 643
Swallows, tree, anti-predator defence by neighbours in 595
Swarm location in zooplankton as an anti-predator defence mechanism 175
Taeniopygia guttata: what causes young males to choose their father as song tutor? 671
TAKEFUSHI, H., *see* TOKIDA, E.
Tamarins, cotton-top, *Saguinus oedipus oedipus*, ontogeny of food-associated calls in 263
Tamias minimus: dynamic averaging of foraging information 787
Tamias striatus, foraging, the effect of competitors and distance 621
TANAKA, I., *see* TOKIDA, E.
TANNER, S. D., *see* GERHARDT, H. C.
TAYLOR, A. C., *see* SMITH, I. P.
TEMELES, E. J. The role of neighbours in territorial systems: when are they 'dear enemies'? .. 339
Temporal cues of call recognition in the green treefrog 1073
Terns, common, *Sterna hirundo*, infanticide in 363
Territorial attacks: infanticide in skimmers and terns 363
Territorial behaviour, and testosterone, in sparrows 77
Territorial defence: role of female diana monkeys 425
Territorial male headbob signals by *Anolis carolinensis* 251
Territorial systems, the role of neighbours in 339
Territory acquisition in lizards; establishing social and spatial relationships 1387
Territory acquisition in lizards; first encounters 1375
Testosterone: effects on spatial activity in male dark-eyed juncos, *Junco hyemalis* 1445
Testosterone and territorial behaviour in sparrows 77
Time budget variation in relation to flock size in carrion crows 1189
Time constraint, mate choice under 141
Tits, blue, *Parus caeruleus*, polygyny in 943
Tits, great, *Parus major*, ectoparasite affects choice and use of roost sites in 895
Tits, marsh, *Parus palustris*, role of age and experience in behavioural development of food-storing and retrieval 1435
Tits, willow, *Parus montanus*, separation of caches between individuals 1031
TOKIDA, E., TANAKA, I., TAKEFUSHI, H. & HAGIWARA, T. Tool-using in Japanese macaques: use of stones to obtain fruit from a pipe 1023
TOLONEN, P., *see* PALOKANGAS, P.
TOMARU, M. & OGUMA, Y. Differences in courtship song in the species of the *Drosophila auraria* complex 133
Tool-using in Japanese macaques: use of stones to obtain fruit from a pipe 1023
TOVEY, C. A., *see* SEELEY, T. D.
Trail-following behaviour in the wood mouse 1127
TRANIELLO, J. F. A., *see* FETHERSTON, I. A.
Trappability of Robertsonian mice 877
Treefrogs, female, and calls; mechanisms of mate choice 1323
Treefrogs, green, *Hyla cinerea*, temporal features mediating call recognition 1073
Treefrogs, grey, *Hyla chrysoscelis*, reproductive character displacement of female mate choice in .. 959
Treefrogs, Pacific, *Hyla regilla*, behavioural plasticity mediates aggression in choruses 633
Trigona fluviventris, avoidance-learning by; effect of pattern and colour 1087
Tringa totanus: flocking as anti-predator strategy 433
TURNER, G. F. The fighting tactics of male mouthbrooding cichlids: the effects of size and residency .. 655
Tutors and bystanders, cultural transmission in pigeons is affected by the number of 331
Urosaurus ornatus: a dual status-signalling system 15
VALLORTIGARA, G., *see* REGOLIN, L.
VERNON, J. G., *see* COOK, S. E.
VICKERY, W. L., DAOUST, J.-L., WARTITI, A. EL & PELTIER, J. The effect of energy and protein content on food choice by deer mice, *Peromyscus maniculatus* (Rodentia) 55

CONTENTS

Vigilance in young baboons: effects of habitat, age, sex and maternal rank on glance rate .. 749
Vocal structure is modified by *Cebuella pygmaea* marmosets in response to changed social environment 1267
Voles, meadow, *Microtus pennsylvanicus*; nest attendance in males; female role in regulating male interactions with pups 1037
Voles, prairie, *Microtus ochrogaster*; alloparental care and the influence of father presence on juveniles 281
WAAS, J. R. & COLGAN, P. W. Male sticklebacks can distinguish between familiar rivals on the basis of visual cues alone 7
WADDINGTON, K. D., *see* BANSCHBACH, V. S.
WALLRAFF, H. G. To be the first in pigeon homing: championship or luck? 883
WALLRAFF, H. G. & KIEPENHEUER, J. Relationships between initial orientation and subsequent homing of individual pigeons 821
WANG, Z. & NOVAK, M. A. Alloparental care and the influence of father presence on juvenile prairie voles, *Microtus ochrogaster* 281
Warblers, hooded, *Wilsonia citrina*; response to threat of cowbird parasitism 275
WARTITI, A. EL, *see* VICKERY, W. L.
WASER, P. M., KEANE, B., CREEL, S. R., ELLIOTT, L. F. & MINCHELLA, D. J. Possible male coalitions in a solitary mongoose 289
WASER, P. M., *see* KEANE, B.
Wasps, parasitoid, *Bracon hebetor*, sex ratio and foundress number in 687
Wasps, parasitoid, *Spalangia cameroni*, effects of host size experience on sex ratios 815
WEARY, D. M., *see* LEMON, R. E.
Weavers, social, grey-capped, *Pseudonigrita arnaudi*, the contribution of helpers to feeding nestlings.. 1047
WEBB, S., *see* HUNTINGFORD, F. A.
WEIHS, D. & KATZIR, G. Bill sweeping in the spoonbill, *Platalea leucordia*: evidence for a hydrodynamic function 649
Wheatear, black, *Oenanthe leucura*; function of stone carrying 1297
WHITE, B. N., *see* QUINN, J. S.
WHITTINGHAM, L. A., *see* QUINN, J. S.
WILDHABER, M. L., GREEN, R. F. & CROWDER, L. B. Bluegills continuously update patch giving up times based on foraging experience 501
WILLIAMS, T. D. Adoption in a precocial species, the lesser snow goose: intergenerational conflict, altruism or a mutually beneficial strategy? 101
WILSON, J. M. Variation in initiator strategy in fighting by silvereyes 153
WINGFIELD, J. C. & HAHN, T. P. Testosterone and territorial behaviour in sedentary and migratory sparrows 77
WINKLER, D. W. Anti-predator defence by neighbours as a responsive amplifier of parental defence in tree swallows 595
Woodpeckers, acorn, *Melanerpes formicivorus*, juvenile dominance in 1121
WOODS, R. E., *see* SCHWARZ, M. P.
WRIGHT, J. & COTTON, P. A. Experimentally induced sex differences in parental care: an effect of certainty of paternity? 1311
WYATT, T. D., *see* GOULSON, D.
Xestobium rufovillosum, mate location in 899
YOERG, S. I. Development of foraging behaviour in the Eurasian dipper, *Cinclus cinclus*, from fledging until dispersal 577
YOUNG, J. R., HUPP, J. W., BRADBURY, J. W. & BRAUN, C. E. Phenotypic divergence of secondary sexual traits among sage grouse, *Centrocercus urophasianus*, populations 1353
ZANFORLIN, M., *see* REGOLIN, L.
ZIEGENFUS, C., *see* CHANDLER, C. R.
Zonotrichia leucophrys pugetensis: testosterone and territorial behaviour 77
Zooplankton, swarm location in, as anti-predator defence mechanism 175
Zosterops lateralis: initiator strategy variation in fighting 153
ZUCKER, N. A dual status-signalling system: a matter of redundancy or differing roles? 15

Short communications

ACKERMANN, L., *see* WEIMERSKIRCH, H.
Activity level and the susceptibility of anuran larvae to predation 465
Adaptive value of spatial learning and memory in the blackeye goby 1462
'Advanced' replaced; new modifiers for the term 'eusocial' 1475

Aggregation behaviour, *Thamnophis butleri*, effects of social and dietary experience on 980
Aggression, female–female, in the pied flycatcher 1479
Alarm calls in *Tringa totanus*, function of 736
ALATALO, R. V., *see* RÄTTI, O.
Albatrosses, black-browed, *Diomedea melanophris*: foraging trips 472
Albatrosses, wandering, *Diomedea exulans*; foraging trips 472
Albatrosses, yellow-nosed, *Diomedea chlororhynchos*; foraging trips 472
Anas penelope: effects of presence of waders on grazing and vigilance behaviour in 488
Anisembia texana: communal nesting and subsociality 971
Anolis cybotes and *A. marcanoi* males discriminate video-recorded displays 1220
Anthus petrosus: food supplementation does not affect territory size 1235
Anuran larvae, susceptibility to predation, and activity level 465
Ape, monogamous, extra-pair copulations in 721
Apis mellifera: function of the mating sign 733
Apus affinis taking over costly nests, infanticide in 491
ARVIDSSON, B. L., *see* ASKENMO, C.
ASKENMO, C., NEERGAARD, R. & ARVIDSSON, B. L. Food supplementation does not affect territory size in rock pipets 1235
Audience effect in budgerigars, *Melopsittacus undulatus* 460
Aunts and nieces, tolerance between, in *Polistes fuscatus* 977
Baboons, savanna, *Papio cynocephalus*, male; a model of coalition formation 211
BALTZ, A. P. & CLARK, A. B. Limited evidence for an audience effect in budgerigars, *Melopsittacus undulatus* 460
BARTOŠ, L. & MADLAFOUSEK, J. Infanticide in a seasonal breeder: the case of red deer 217
Beavers, *Castor canadensis*, foraging on woody plants, perceptual cues used by 1482
Bees, honey, *Apis mellifera*, function of the mating sign in 733
Birds: can extra-pair copulations be used to predict extra-pair paternity in 983
BJÖRKLUND, M., MØLLER, A. P. & SUNDBERG, J. Mate guarding in the great tit: a reply to Blakey & Norris 1230
BLAKEY, J. K. & NORRIS, K. Do female great tits avoid extra-pair copulations? A comment on Björklund et al. 1227
BRODIN, A. The disappearance of caches that have been stored by naturally foraging willow tits .. 730
Budgerigars, *Melopsittacus undulatus*, audience effect in 460
BURA, E. A. & GAMBOA, G. J. Kin recognition by social wasps: asymmetric tolerance between aunts and nieces 977
BURGHARDT, G. M., *see* DOUGHTY, P.
BURGHARDT, G. M., *see* LYMAN-HENLEY, L. P.
Cache dispersion by grey jays sequentially exploiting adjacent sources 1232
Caches stored by willow tits, disappearance of 730
Calls, alarm, in *Tringa totanus*, function of 736
Cannibalism, sexual, in male autumn spiders is reduced by male exploitation of female predatory behaviour 235
Cannibalism, sexual, in the praying mantis 739
Castor canadensis: perceptual cues used in foraging on woody plants 1482
Cats, domestic, *Felis silvestris catus*, and passive submission 457
Cervus elaphus: infanticide 217
Chaffinches, *Fringilla coelebs*, song rate and fertility in 986
CHASTEL, O., *see* WEIMERSKIRCH, H.
CHAURAND, T., *see* WEIMERSKIRCH, H.
Chicks, junglefowl, *Gallus gallus spadiceus*, potentiation in learning about the visual features of .. 1468
Chipmunks, least, *Tamias minimus*, spatial navigation by 727
CHOE, J. C. Communal nesting and subsociality in a webspinner, *Anisembia texana* (Insecta: Embiidina: Anisembiidae) 971
Choice experiments and cognition: a reply to Lamprecht & Hofer 1459
Cichlasoma nigrofasciatum: parental warning signals are socially facilitated 974
Cichlids, convict, *Cichlasoma nigrofasciatum*; the warning signals of parents are socially facilitated .. 974
CLARK, A. B., *see* BALTZ, A. P.
Clethrionomys glareolus: neighbour effects on the development of locomotor stereotypies 214
Coalition formation among male baboons, a model 211
Cognition and choice experiments; bluegill sunfish 1459
Cognitive abilities and cooperation among sunfish 1457
Colour: potentiation in learning about the visual features of an imprinting stimulus 1468
Communal nesting and subsociality in *Anisembia texana* 971

CONTENTS

Communally breeding dormice are close kin 1485
Cooper, J. J. & Nicol, C. J. Neighbour effects on the development of locomotor stereotypies in bank voles, *Clethrionomys glareolus* 214
Cooperation among sunfish: do they have the cognitive abilities? 1457
Copulations, extra-pair, avoidance by female great tits 1227
Copulations, extra-pair, in a monogamous ape 721
Copulations, extra-pair, and extra-pair paternity in birds 983
Copulation, frequent, and female guarding of mates in *Tachycineta bicolor* 994
Coryphopterus nicholsi: an adaptive value of spatial learning and memory 1462
Costs of vigilance in foraging ungulates 481
Costly nests, infanticide in little swifts taking over 491
Courtship in the praying mantis 739
Crampton, W. G. R. & Hurst, L. D. True kin recognition, in the form of somatic incompatibility, has multiple independent origins 230
Cresswell, W. The function of alarm calls in redshanks, *Tringa totanus* 736
Crustacea, mate-guarding, effect of female resistance on precopula duration in 1471
Cuenot-Chaillet, F., *see* Chaurand, T.
Cues, perceptual, used by beavers foraging on woody plants 1482
Damselflies, *Enallagma boreale*, tests of hypotheses for female-limited polymorphism in 724
Deer, red, *Cervus elaphus*, infanticide in 217
De Haan, J., *see* Van Kampen, H. S.
Desmognathus fuscus: males may choose larger females as mates 1465
Development of locomotor stereotypies in bank voles, neighbour effects on 214
Devenport, J. A. & Devenport, L. D. Spatial navigation in natural habitats by ground-dwelling sciurids 727
Devenport, L. D., *see* Devenport, J. A.
De Vos, G. J., *see* Van Kampen, H. S.
Dietary experience, effect on snake aggregation behaviour 980
Diomedea chlororhynchos: foraging trips 472
Diomedea exulans: foraging trips 472
Diomedea melanophris: foraging trips 472
Dispersal, sex-biased, in a polygynous lizard 227
Displays, video-recorded; discrimination by male *Anolis* lizards 1220
Distribution, free, ideal; common misconceptions 485
Distribution, free, ideal, a reason for departures from; perceptual constraints on optimal foraging .. 469
Dormice, *Glis glis*, communally breeding, are close kin 1485
Doucet, C. M., Walton, R. A. & Fryxell, J. M. Perceptual cues used by beavers foraging on woody plants 1482
Doughty, P., Sinervo, B. & Burghardt, G. M. Sex-biased dispersal in a polygynous lizard, *Uta stansburiana* 227
Dugatkin, L. A. & Wilson, D. S. Choice experiments and cognition: a reply to Lamprecht & Hofer .. 1459
Dunn, P. O. & Lifjeld, J. T. Can extra-pair copulations be used to predict extra-pair paternity in birds? 983
Dunn, P. O., *see* Whittingham, L. A.
Elwood, R. W., *see* Prenter, J.
Enallagma boreale: tests of hypotheses for female-limited polymorphism 724
'Eusocial', new modifiers for 1475
Evans, C. S., *see* Macedonia, J. M.
Feldman, H. N. Domestic cats and passive submission 457
Felis silvestris catus and passive submission 457
Female–female aggression in the pied flycatcher 1479
Female great tits, avoidance of extra-pair copulation by 1227
Females, larger, chosen as mates by males, in *Desmognathus fuscus* 1465
Female-limited polymorphism in the damselfly 724
Females, mixed mating strategies by, and the sexy son hypothesis 1207, 1210
Female parasitoid and recognition of a previously rejected host 988
Female predatory behaviour, male exploitation of; reduction of sexual cannibalism in male autumn spiders 235
Female resistance, effect on size-dependent precopula duration in mate-guarding Crustacea .. 1471
Female tree swallows, do they guard their mates by copulating frequently? 994
Fertility and song rate in the chaffinch 986
Ficedula hypoleuca: female–female aggression and male polyterritoriality 1479
Fighting ability and coalition formation among male baboons 211

Fission in primate troops; a new model 223
FITZGIBBON, C., *see* ILLIUS, A. W.
Flycatchers, pied, *Ficedula hypoleuca*, female–female aggression and male polyterritoriality in .. 1479
Food supplementation does not affect territory size in rock pipits 1235
Foraging beavers, perceptual cues used by 1482
Foraging, optimal, perceptual constraints on; a reason for departures from the ideal free distribution? 469
Foraging trips, alternate long and short, in pelagic seabird parents 472
Foraging ungulates, costs of vigilance in 481
FORBES, M. Tests of hypotheses for female-limited polymorphism in the damselfly, *Enallagma boreale* Selys 724
Fringilla coelebs: song rate and fertility 986
FRYXELL, J. M., *see* DOUCET, C. M.
Gallus gallus spadiceus chicks: potentiation in learning about the visual features of an imprinting stimulus 1468
GAMBOA, G. J., *see* BURA, E. A.
Gasterosteus aculeatus: mate choice; a reply to Goldschmidt et al. 991
Genetic similarity theory, and human assortative mating 463
Glis glis, communally breeding, are close kin 1485
Gobies, blackeye, *Coryphopterus nicholsi*, an adaptive value of spatial learning and memory in .. 1462
Gobies, common, *Pomatoschistus microps*, alternative spawning tactics in 1212
GRAVES, B. M. The role of nasolabial grooves and the vomeronasal system in recognition of home area by red-backed salamanders 1216
GRAY, R. D. & KENNEDY, M. Perceptual constraints on optimal foraging: a reason for departures from the ideal free distribution? 469
Grazing and vigilance behaviour in breeding wigeon, *Anas penelope*, effects of presence of waders on.. 488
Guarding, mate, in the great tit 1230
Halobaena caerulea: foraging trips 472
HANSEN, L. P. & JONSSON, B. Homing of Atlantic salmon: effects of juvenile learning on transplanted post-spawners 220
HENZI, S. P., *see* RON, T.
HINDERMEYER, X., *see* WEIMERSKIRCH, H.
HOFER, H., *see* LAMPRECHT, J.
Homing of Atlantic salmon 220
HORNIG, L. E. & MCCLINTOCK, M. K. Unmasking sex-ratio biasing through targeted analysis .. 1224
Host, previously rejected, and recognition by a female parasitoid 988
HOTTA, M. Infanticide in little swifts taking over costly nests 491
Human assortative mating: questions concerning genetic similarity theory 463
HUNTINGFORD, F. A., *see* MCLEOD, P. G.
HURST, L. D., *see* CRAMPTON, W. G. R.
Idotea baltica: effect of female resistance on precopula duration in 1471
ILLIUS, A. W. & FITZGIBBON, C. Costs of vigilance in foraging ungulates 481
Imprinting stimulus, potentiation in learning about the visual features of 1468
Incompatibility, somatic, and true kin recognition 230
Infanticide in little swifts taking over costly nests 491
Infanticide in red deer 217
JACOBSEN, O. W. & UGELVIK, M. Effects of presence of waders on grazing and vigilance behaviour in breeding wigeon, *Anas penelope* 488
JAMIESON, I. Mate choice in three-spined sticklebacks: a reply to Goldschmidt et al. 991
Jays, grey, *Perisoerus canadensis*, cache dispersion by 1232
JONSSON, B., *see* HANSEN, L. P.
JORMALAINEN, V., TUOMI, J. & MERILAITA, S. Effect of female resistance on size-dependent precopula duration in mate-guarding Crustacea 1471
JUDAS, J., *see* CHAURAND, T.
Junglefowl chicks, *Gallus gallus spadiceus*, potentiation in learning about the visual features of an imprinting stimulus 1468
Juvenile learning; homing of Atlantic salmon 220
KABAT, L., *see* WOYCIECHOWSKI, M.
KENNEDY, M., *see* GRAY, R. D.
KILPIMAA, J., *see* RÄTTI, O.
Kin recognition by social wasps: asymmetric tolerance between aunts and nieces 977
Kin recognition, true, in the form of somatic incompatibility 230
Kinship of communally breeding dormice, *Glis glis* 1485

CONTENTS

KRÓL, E., *see* WOYCIECHOWSKI, M.
KUKUK, P. F. Replacing the terms 'primitive' and 'advanced': new modifiers for the term 'eusocial' .. 1475
KYNASTON, S. E., MCERLAIN-WARD, P. & MILL, P. J. Courtship, mating behaviour and sexual cannibalism in the praying mantis, *Sphodromantis lineola* 739
LAMPRECHT, J. & HOFER, H. Cooperation among sunfish: do they have the cognitive abilities? .. 1457
Larvae, anuran, susceptibility to predation, and activity level 465
LAVERY, R. J., *see* SHENNAN, M. G. C.
LAWRENCE, A. B., *see* YOUNG, R. J.
Learning about the visual features of an imprinting stimulus 1468
Learning, juvenile; homing of Atlantic salmon 220
Learning, spatial, and memory in the blackeye goby, an adaptive value of 1462
LEBORGNE, R., *see* PASQUET, A.
Lepomis macrochirus: choice experiments and cognition 1459
Lepomis macrochirus, cooperation among; do they have the cognitive ability? 1457
LIFJELD, J. T., *see* DUNN, P. O.
Lizards, *Anolis*, male, discriminate video-recorded displays 1220
Lizards, *Uta stansburiana*, sex-biased dispersal in 227
Locomotor stereotypies in bank voles, neighbour effects on the development of 214
LOSOS, J. B., *see* MACEDONIA, J. M.
LYMAN-HENLEY, L. P. & BURGHARDT, G. M. Opposites attract: effects of social and dietary experience on snake aggregation behaviour 980
MCCLINTOCK, M. K., *see* HORNIG, L. E.
MACEDONIA, J. M., EVANS, C. S. & LOSOS, J. B. Male *Anolis* lizards discriminate video-recorded conspecific and heterospecific displays 1220
MCERLAIN-WARD, P., *see* KYNASTON, S. E.
MACLEOD, H. A., *see* YOUNG, R. J.
MCLEOD, P. G. & HUNTINGFORD, F. A. Social rank and predator inspection in sticklebacks .. 1238
MADLAFOUSEK, J., *see* BARTOŠ, L.
MAGNHAGEN, C. Sneak or challenge: alternative spawning tactics in non-territorial male common gobies 1212
Male *Anolis* lizards discriminate video-recorded displays 1220
Male baboons, a model of coalition formation among 211
Males may choose larger females as mates in *Desmognathus fuscus* 1465
Male common gobies, non-territorial, alternative spawning tactics in 1212
Male exploitation of female predatory behaviour reduces sexual cannibalism in male autumn spiders .. 235
Male polyterritoriality and female–female aggression in the pied flycatcher 1479
Manipulandum design: effect on operant responding in pigs 1488
Mantis, praying, *Sphodromantis lineola*, courtship, mating behaviour and sexual cannibalism in .. 739
MARIN, G. & PILASTRO, A. Communally breeding dormice, *Glis glis*, are close kin 1485
MARKEL, R. W. An adaptive value of spatial learning and memory in the blackeye goby, *Coryphopterus nicholsi* 1462
Mate choice in three-spined sticklebacks: a reply to Goldschmidt et al. 991
Mate-guarding Crustacea, effect of female resistance on precopula duration in 1471
Mate guarding by females, and frequent copulation, in *Tachycineta bicolor* 994
Mate guarding in the great tit 1230
Mates, males may choose larger females as, in *Desmognathus fuscus* 1465
Mating, assortative, human; questions concerning genetic similarity theory 463
Mating behaviour in the praying mantis 739
Mating sign in honey bees, function of 733
Mating strategies, mixed, by females, and the sexy son hypothesis 1207, 1210
Melopsittacus undulatus: audience effect 460
Memory, an adaptive value of spatial learning and, in the blackeye goby 1462
MERILAITA, S., *see* JORMALAINEN, V.
Metellina segmentata, male, sexual cannibalism in 235
MILL, P. J., *see* KYNASTON, S. E.
MØLLER, A. P., *see* BJÖRKLUND, M.
Monogamous ape, extra-pair copulations in 721
MONTGOMERY, W. L., *see* PRENTER, J.
MOTRO, U., *see* RON, T.
Nasolabial grooves, role in recognition of home area by red-backed salamanders 1216
Navigation, spatial, in natural habitats by ground-dwelling sciurids 727
NEERGAARD, R., *see* ASKENMO, C.
Neighbour effects on development of locomotor stereotypies in bank voles 214

Nests, costly, infanticide in little swifts taking over 491
Nesting, communal, and subsociality in *Anisembia texana* 971
NICOL, C. J., *see* COOPER, J. J.
Nieces and aunts, tolerance between, in *Polistes fuscatus* 977
NOË, R. A model of coalition formation among male baboons with fighting ability as the crucial parameter 211
NORRIS, K., *see* BLAKEY, J. K.
Pachyptilla belcheri: foraging trips 472
PALOMBIT, R. A. Extra-pair copulations in a monogamous ape 721
Papio cynocephalus, male, a model of coalition formation among 211
Parasitoid, female, and recognition of a previously rejected host 988
Parental convict cichlids: warning signals are socially facilitated 974
Parus major: avoidance of extra-pair copulations 1227
Parus major: mate guarding 1230
Parus montanus, naturally foraging, disappearance of caches stored by 730
PASQUET, A., RIDWAN, A. & LEBORGNE, R. Presence of potential prey affects web-building in an orb-weaving spider *Zygiella x-notata* 477
Paternity, extra-pair, and extra-pair copulations in birds 983
Pelagic seabird parents, alternate long and short foraging trips 472
Pelecanoïdes urinatrix: foraging trips 472
Perisoreus canadensis: cache dispersion 1232
Petrels, blue, *Halobaena caerulea*; foraging trips 472
Petrels, diving, *Pelecanoïdes urinatrix*; foraging trips 472
Pigs, *Sus scrofa*, effect of manipulation design on operant responding in 1488
PILASTRO, A., *see* MARIN, G.
Pipits, rock, *Anthus petrosus*, food supplementation does not affect territory size 1235
Plethodon cinereus: role of nasolabial grooves and the vomeronasal system in recognition of home area 1216
Polistes fuscatus: kin recognition; aunt–niece tolerance 977
Polygynous lizard, sex-biased dispersal in 227
Polymorphism, female-limited, in the damselfly 724
Pomatoschistus microps: alternative spawning tactics 1212
Precopula duration in mate-guarding Crustacea, effect of female resistance on 1471
Predation, activity level and the susceptibility of anuran larvae to 465
Predator inspection and social rank in sticklebacks 1238
Predatory behaviour, female, male exploitation of; reduction of sexual cannibalism in male autumn spiders 235
PRENTER, J., ELWOOD, R. W. & MONTGOMERY, W. L. Male exploitation of females predatory behaviour reduces sexual cannibalism in male autumn spiders, *Metellina segmentata* .. 235
Prey, potential, presence of, affects web-building in an orb-weaving spider, *Zygiella x-notata* .. 477
Primate troops, a new model of fission in 223
'Primitive' replaced; new modifiers for the term 'eusocial' 1475
Prions, thin-billed, *Pachyptilla belcheri*; foraging trips 472
Rank, social, and predator inspection in sticklebacks 1238
RÄTTI, O., ALATALO, R. V., KILPIMAA, J. & SIIKAMÄKI, P. Female–female aggression and male polyterritoriality in the pied flycatcher 1479
Recognition of home area by red-backed salamanders, role of nasolabial grooves and the vomeronasal system in 1216
Recognition, kin, by social wasps; tolerance between aunts and nieces 977
Recognition, kin, true, in the form of somatic incompatibility 230
Redshanks, *Tringa totanus*, function of alarm calls in 736
REEVES, J. D., *see* WAITE, T. A.
RIDWAN, A., *see* PASQUET, A.
ROBERTSON, R. J., *see* WHITTINGHAM, L. A.
RON, T., HENZI, S. P. & MOTRO, U. A new model of fission in primate troops 223
RUSSELL, R. J. H. & WELLS, P. A. Human assortative mating: questions concerning genetic similarity theory 463
Salamanders, *Desmognathus fuscus*, males may choose larger females as mates in 1465
Salamanders, red-backed, *Plethodon cinereus*, role of nasolabial grooves and the vomeronasal system in recognition of home area 1216
Salmo salar, Atlantic salmon, homing of 220
Sciurids, ground-dwelling, spatial navigation in natural habitats by 727
Sex-biased dispersal in a polygynous lizard 227

CONTENTS

Sex-ratio biasing unmasked through targeted analysis 1224
Sexual cannibalism in male autumn spiders is reduced by male exploitation of female predatory behaviour 235
Sexual cannibalism in the praying mantis 739
Sexy son hypothesis and mixed mating strategies by females 1207,1210
SHELDON, B. C. Song rate and fertility in the chaffinch 986
SHENNAN, M. G. C., WAAS, J. R. & LAVERY, R. J. The warning signals of parental convict cichlids are socially facilitated 974
Signals, warning, of parental convict cichlids are socially facilitated 974
SIIKAMÄKI, P., *see* RÄTTI, O.
SINERVO, B., *see* DOUGHTY, P.
Size of territory is not affected by food supplementation in rock pipits 1235
Size-dependent precopula duration in mate-guarding Crustacea, effect of female resistance on .. 1471
SKELLY, D. K. Activity level and the susceptibility of anuran larvae to predation 465
Snake, garter, *Thamnophis butleri*, effects of social and dietary experience on aggregation behaviour .. 980
Sneak or challenge: alternative spawning tactics in non-territorial male common gobies 1212
Social experience, effect on snake aggregation behaviour 980
Social rank and predator inspection in sticklebacks 1238
Somatic incompatibility, true kin recognition in the form of 230
Song rate and fertility in the chaffinch 986
Spatial learning and memory in the blackeye goby, an adaptive value of 1462
Spatial navigation in natural habitats by ground-dwelling sciurids 727
Spawning tactics in non-territorial male common gobies 1212
Spermophilus lateralis: spatial navigation 727
Sphodromantis lineola: courtship, mating behaviour and sexual cannibalism 739
Spiders, autumn, *Metellina segmentata*, male, sexual cannibalism in 235
Spiders, orb-weaving, *Zygiella x-notata*, presence of potential prey affects web-building in .. 477
Squirrels, ground, golden-mantled, *Spermophilus lateralis*, spatial navigation by 727
Sticklebacks, social rank and predator inspection in 1238
Sticklebacks, three-spined, *Gasterosteus aculeatus*, mate choice in; reply to Goldschmidt et al. .. 991
Submission, passive, and domestic cats 457
SUNDBERG, J., *see* BJÖRKLUND, M.
Sunfish, bluegill, *Lepomis macrochirus*; choice experiments and cognition 1459
Sunfish, bluegill, *Lepomis macrochirus*, cooperation among; do they have the cognitive ability? .. 1457
Sus scrofa: effect of manipulandum design on operant responding 1488
Swallows, tree, *Tachycineta bicolor*, mate-guarding and frequent copulation 994
Swifts, little, *Apus affinis*, taking over costly nests, infanticide in 491
Tachycineta bicolor: do females guard their mates by frequent copulation? 994
Tamias minimus: spatial navigation 727
TANAKA, T., *see* UENO, T.
Territory size in rock pipits is not affected by food supplementation 1235
Thamnophis butleri: effects of social and dietary experience on aggregation behaviour 980
Tits, great, *Parus major*, female, avoidance of extra-pair copulations by 1227
Tits, great, *Parus major*, mate-guarding in 1230
Tits, willow, naturally foraging, disappearance of caches stored by 730
TREGENZA, T. Common misconceptions in applying the ideal free distribution 485
Tringa totanus: function of alarm calls 736
Troops, primate, a new model of fission in 223
TUOMI, J., *see* JORMALAINEN, V.
UENO, T. & TANAKA, T. Can a female parasitoid recognize a previously rejected host? 988
UGELVIK, M., *see* JACOBSEN, O. W.
Ungulates, foraging, costs of vigilance in 481
Uta stansburiana: sex-biased dispersal 227
VAN KAMPEN, H. S., DE HAAN, J. & DE VOS, G. J. Potentiation in learning about the visual features of an imprinting stimulus 1468
VERREL, P. A. Males may choose larger females as mates in the salamander *Desmognathus fuscus* .. 1465
Vigilance behaviour in breeding wigeon, effects of presence of waders on 488
Vigilance costs in foraging ungulates 481
Visual features of an imprinting stimulus, potentiation in learning about 1468
Voles, bank, *Clethrionomys glareolus*, neighbour effects on the development of locomotor stereotypies in 214
Vomeronasal system, role in recognition of home area by red-backed salamanders 1216
WAAS, J. R., *see* SHENNAN, M. G. C.

Waders, effects of presence of, on grazing and vigilance behaviour in breeding wigeon, *Anas penelope* .. 488
WAGNER, R. H. Mixed mating strategies by females weaken the sexy son hypothesis 1207
WAITE, T. A. & REEVES, J. D. Cache dispersion by grey jays sequentially exploiting adjacent sources 1232
WALTON, R. A., *see* DOUCET, C. M.
Warning signals of parental convict cichlids are socially facilitated 974
Wasps, social, *Polistes fuscatus*, kin recognition by 977
WEATHERHEAD, P. J. Mixed mating strategies by females may strengthen the sexy son hypothesis.... 1210
Web-building in an orb-weaving spider is affected by presence of potential prey 477
Webspinner, *Anisembia texana*, communal nesting and subsociality in 971
WEIMERSKIRCH, H., CHASTEL, O., ACKERMANN, L., CHAURAND, T., CUENOT-CHAILLET, F., HINDERMEYER, X. & JUDAS, J. Alternate long and short foraging trips in pelagic seabird parents 472
WELLS, P. A., *see* RUSSELL, R. J. H.
WHITTINGHAM, L. A., DUNN, P. O. & ROBERTSON, R. J. Do female tree swallows guard their mates by copulating frequently? 994
Wigeon, *Anas penelope*, breeding; effects of presence of waders on grazing and vigilance behaviour in 488
WILSON, D. S., *see* DUGATKIN, L. A.
WOYCIECHOWSKI, M., KABAT, L. & KRÓL, E. The function of the mating sign in honey bees, *Apis mellifera* L.: new evidence 733
YOUNG, R. J., MACLEOD, H. A. & LAWRENCE, A. B. Effect of manipulandum design on operant responding in pigs 1488
Zygiella x-notata: presence of potential prey affects web-building 477

Book reviews

BERTRAM, B. C. R. The Ostrich Communal Nesting System 237
BIRKHEAD, T. Great Auk Islands. A Field Biologist in the Arctic 1247
BRADSHAW, J. & ROGERS, L. The Evolution of Lateral Asymmetries, Languages, Tool Use and Intellect 237
DAWKINS, M. S. Through Our Eyes Only? The Search for Animal Consciousness 1245
DWORKIN, B. R. Learning and Physiological Regulation 1495
FINDLEY, J. S. Bats, A Community Perspective 1494
GANS, C. & CREWS, D. (Eds) Hormones, Brain and Behavior: Biology of the Reptilia, Vol. 18, Physiology E. 746
HUGHES, R. N. (Ed.) Diet Selection. An Interdisciplinary Approach to Foraging Behaviour 499
ITÔ, Y. Behaviour and Social Evolution of Wasps. The Communal Aggregation Hypothesis 498
KREBS, J. R. & DAVIES, N. B. An Introduction to Behavioural Ecology. 3rd edn. 744
KUMMER, H. Vies de Singes. Moeurs et Structures Sociales des Babouins Hamadryas 1491
LUTHERER, L. O. & SIMON, M. S., with a foreword by J. M. OREM. Targeted: The Anatomy of an Animal Rights Attack 495
MCEVEY, S. F. (Ed.) Evolution and the Recognition Concept of Species. Collected Writings of Hugh E. H. Paterson 240
MCFARLAND, D. Animal Behaviour. 2nd edn. 1492
MCGREGOR, P. K. (Ed.) Playback and Studies of Animal Communication 239
MANLY, B., MCDONALD, L. & THOMAS, D. Resource Selection by Animals. Statistical Design and Analysis for Field Studies 238
PAPAJ, D. R. & LEWIS, A. C. (Eds) Insect Learning. Ecological and Evolutionary Perspectives 743
ROUBICK, D. W. Ecology and Natural History of Tropical Bees 498
SHAIR, H. N., BARR, G. A. & HOFER, M. A. (Eds) Developmental Psychobiology: New Methods and Changing Concepts 1244
SMITH, E. A. & WINTERHALDER, B. (Eds) Evolutionary Ecology and Human Behavior 496
STAMP, N. E. & CASEY, T. M. (Eds) Caterpillars: Ecological and Evolutionary Constraints on Foraging 1493
WENNER, A. M. & WELLS, P. H. Anatomy of a Controversy: the Question of a 'Language' Among Bees 1241, 1242
WILLIAMS, G. C. Natural Selection. Domains, Levels and Challenges 745